

DEVELOPMENT OF TEMPERATURE AND POWER FAILURE EVENT MONITORING FOR HOSPITAL COLD STORAGES USING IoT AND CLOUD

Submitted in partial fulfilment of requirements for the award of
Bachelor of Engineering in Electronics and Communication Engineering

by

V YESHWANTH (39130501)



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade "A" by NAAC
JEPPIAAR NAGAR, RAJIV GANDHI SALAI,
CHENNAI – 600119**

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Accredited with "A" grade by NAAC

Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai – 600 119

www.sathyabama.ac.in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of V YESHWANTH (39130501) and who carried out the project entitled "**DEVELOPMENT OF TEMPERATURE AND POWER FAILURE EVENT MONITORING SYSTEM FOR HOSPITAL COLD STORAGES USING IoT AND CLOUD**" under my supervision from NOV 2022 to APR 2023.

Internal Guide

Dr. K.V. KARTHIKEYAN, M.E., Ph.D.,

Head of the Department

Dr. T.RAVI M.E., Ph.D.,

Submitted for Viva voce Examination held on 19/04/2023

Internal Examiner

External Examiner

DECLARATION

I, V. YESHWANTH (39130501) hereby declare that the Project Report entitled **“DEVELOPMENT OF TEMPERATURE AND POWER FAILURE EVENT MONITORING SYSTEM FOR HOSPITAL COLD STORAGES USING IoT AND CLOUD”** done by me under the guidance of Dr. K.V.KARTHIKEYAN., M.E., Ph.D, Professor is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

DATE: 19/04/2023

PLACE: CHENNAI.

A handwritten signature in blue ink, appearing to read 'V. Yeshwanth', with a stylized flourish at the end.

SIGNATURE OF THE CANDIDATE

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ABSTRACT

Transformers are an essential element of electrical components that are utilized all over the world. The duty of keeping track of the condition is now a fierce one. Because any disruption to the structural features would lead to a significant loss. As a result, it is vital to maintain a check on a frequent basis. The major goal of this project is to use advanced technologies to collect metadata on equipment conditions through the web. We will keep an eye on the voltage of the equipment. This information will be transferred over wi-fi through the web. The viewer will be contacted including an alarm signal if there is a power outage utilizing esp32 units. It also has a unique feature of detecting phase failure. The indicator would illuminate on the control kit if any segment becomes defective. Such variables will be shown on the screen. Such an approach allows us to monitor the equipment's condition on a continuous basis and take the appropriate steps to ensure that it is properly maintained. Our proposed system is subjected to centralized monitoring of Temperature for Hospital Cold storage Using the Internet of Things. We maintain the data in the cloud with the help of a continuous data uplink process on the server. Indication of Power failure is mandatory for our project to collect the data without any loss. Thus, to make the system efficient we divide the project into two categories phase 1 project deals with power tracking phase 2 project deals with effective uploading of temperature data from storage units. Hence our system will be power effective and smart for supporting the instant cloud data.

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CHAPTER 1

INTRODUCTION

A phasing failure happens whenever one of the 3 phases is disrupted. A broken breaker, heating stress, damaged cable, deteriorated connection, or equipment problem are common causes of single phasing. It is indeed a sophisticated technology that detects outages. There still are three stages. When any of the phases detects a problem, it sends a text signal to the appropriate authorities. The ESP32 module is linked to this IoT system, and the connection is linked for configuring purposes. When the phases are separated, the system displays an outage on the LCD, along with the terminal voltage, and then sounds an alarm. Then it informs the authorized service of the detached stage by sending a signal.

When restoring electricity towards the step method, an alarm sounds & data about the phase's operation would be sent to the authoritative user's contact details. As a result, the proper agency is immediately contacted, and they can act swiftly to resolve the issue. The IoT is bringing the lines between the physical together to make society across us intelligent and much more adaptive.

Any physical thing that can be linked to the internet and operate or convey data can be converted into an electronic gateway. Data from the temperature and humidity sensor will send the data to the system which is linked with a proper set point. Here the data can be varied based on the threshold of the system. Thus, this system is super intelligent to update us regarding system failure, power failure, malfunctions, set point I2C failures, etc.

1.1 Relevance of the project:

According to the research framework of planned and executed developments, there's still a big opportunity to be explored from the application of monitoring and computing technologies in electrical networks and certain other industries. It should also be acknowledged that there were no tests or developments that used virtualization as well as sensor technology in multiple power outages control and implementation, allowing alarm signal, placement, condition, intensity, and quantification documentation to be sent to both cellphones but rather cloud solutions for capacity and destination tenacity on destination graphs.

For power transmission damage detection, the authors think of a cellular system. Their output, amperage, and rate are all sensed by a processor. This information is then transferred to a cell device and displayed on a workstation by serial connection. The experts, on the other hand, do not investigate the utilization of cloud infrastructure through WiFi, nor do they investigate the advantages of using geographical mapping to locate the reported defects and suggest using GSM tools to track substation characteristics such as voltage and current (overcharge, power quality issues, and overheating) and transmit this data to the operator's cell phone for more intervention.

MQTT (Message Queuing Telemetry Transport) is a lightweight, publish-subscribe messaging protocol designed for low-bandwidth, high-latency, and unreliable networks. It was first developed in 1999 by Andy Stanford-Clark of IBM and Arlen Nipper of Eurotech.

MQTT uses a publish-subscribe model, where clients connect to a broker and subscribe to topics. The broker is responsible for receiving messages from publishers and forwarding them to the subscribed clients. Messages are sent as binary data and can contain any type of data, such as sensor data or control commands.

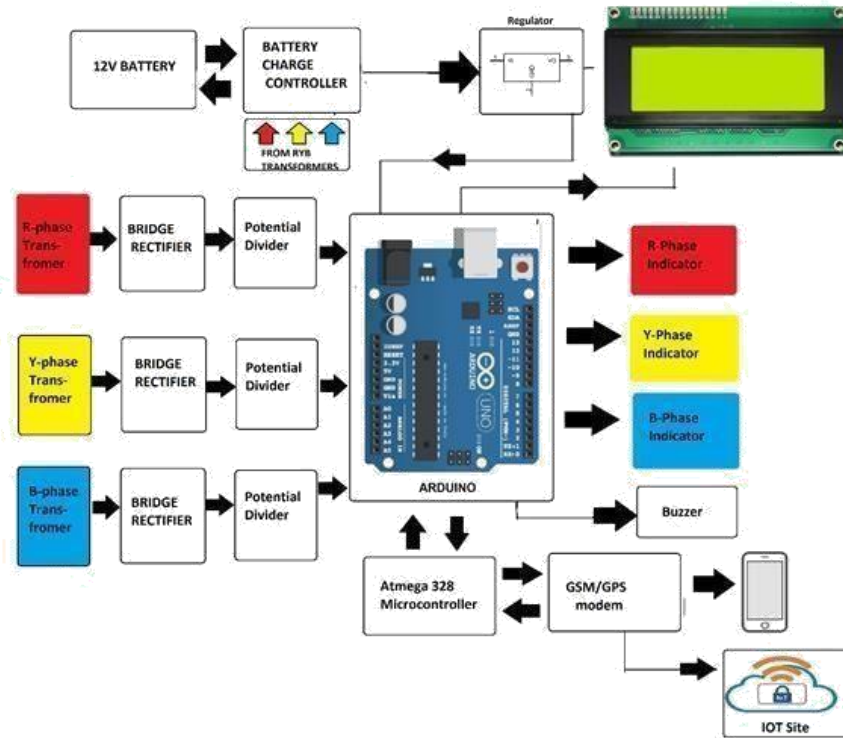


Fig 1.1 – Architecture Block of Power Failure Indicator Over IoT

The modification in quality of the characteristics is sent to the carriers by Text messages using GSM technology, so administrators could text message to examine the substation's statistics.

The electrical values are sensed using an Embedded system. The authors, on the other hand, do not investigate the usage of cloud technologies, WLAN, or the advantages of using position information to locate the reported defects. To detect circuit characteristics such as critical load, pressure, and load conditions, the authors employ a combination of GSM, Texting, and processor solution.

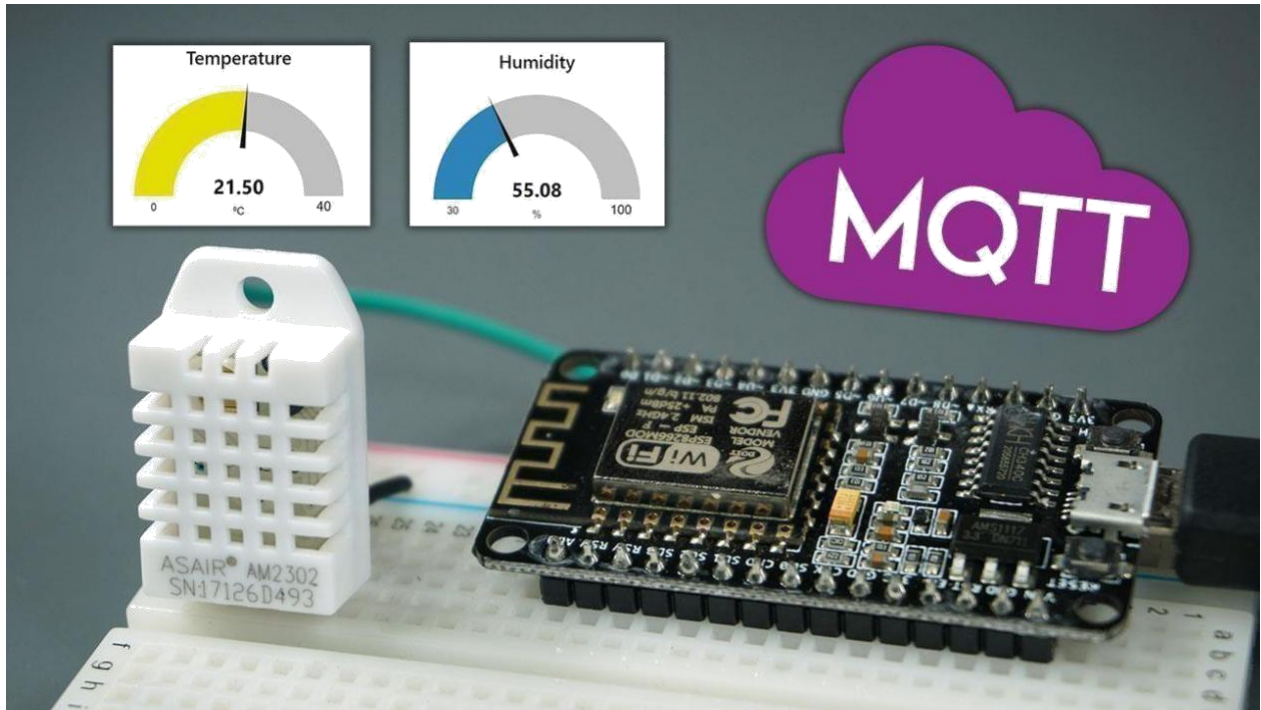


Fig 1.2 – DHT22 I2C-based Temperature and Humidity Update

The study develops even further by utilizing the attachment of the microprocessor to a machine, allowing for converter state management. A speculative plan is a detailed method defined as the problem-solving stage of study in which the researcher concentrates on the report's area while anticipating challenges at a later time. In addition, a study master plan specifies the methods as a sort of study that is used to provide a broad picture or an outline by examining the views, practices, ideas, and sentiments of a select sample of people. Usage scenarios depict how users engage through its context by depicting the actions done by the information system and thus the actions of the platform. The Arduino is a microcontroller device open-sourced microcontroller device that consists of circuitry and a program known as the Arduino IDE which is utilized to create and transfer computer algorithms to the connected device. Arduino has analog and digital pins that may be configured as serial communication signals using the Arduino Software.

1.2 Problem Statement:

In recent research, in metropolitan cities, the parking management problem can be viewed from various angles such as high vehicle density on roads. This results in annoying issues for the drivers to park their vehicles as it is very difficult to find a parking slot. The drivers usually waste time and effort in finding parking spaces and end up parking their vehicles and finding a space on the street which further leads to space congestion. In the worst case, people fail to find any parking space, especially during peak hours and the festive season.

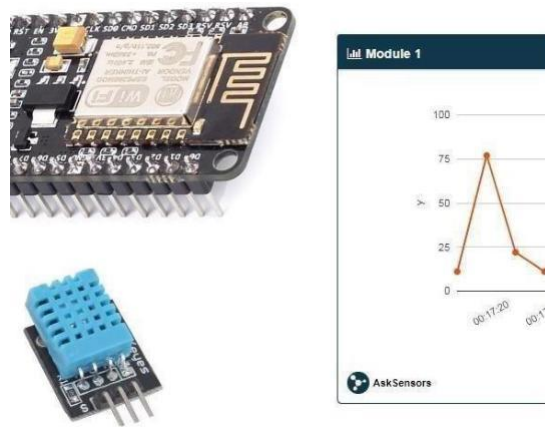


Fig1.3 – Digital Data Graph Over Cloud

There is a need to develop an automated and efficient monitoring system for hospital cold storages that can alert the concerned personnel in real-time of temperature fluctuations and power failures. This system should be cost-effective, easily scalable, and provide real-time data analytics to identify patterns of temperature and power failures to prevent future occurrences. The solution should leverage IoT and cloud technologies to enable remote monitoring and management of the hospital cold storages, thereby improving the reliability and safety of the medication and vaccine storage process.

1.3 Objective:

The model was developed and tested in a laboratory setting by linking it to a 3- phase power source as well as a cell for standby, as illustrated in Fig 1.1. A browser-based client on a desktop was utilized to interface to the virtual machine, and a cellphone was utilized to receive notifications from the device. The status of the 3 phases was effectively shown on the LCD, network infrastructure, and an alarm message was delivered to the smartphone when the electricity was turned on. The amount of time required to display the three-phase voltage readings from both the local Digital display and the community cloud was tested and found. Simultaneously, a Message confirming the condition of the 3 phase is sent to a predetermined cell number. After that, the phone's red phase power was severed. The red phase dc supply and condition were simply moved and shown on the regional Display, network infrastructure, and cellphone, with the transfer taking only seconds. This was done for other stages as well, with comparable outcomes each time. After all of the components were removed, a zero-reference voltage for all of them was transmitted to the regional Screen, virtual machines, and smartphone as aspect conditions. The gadget was able to operate upon that cell after the different stages were unplugged.

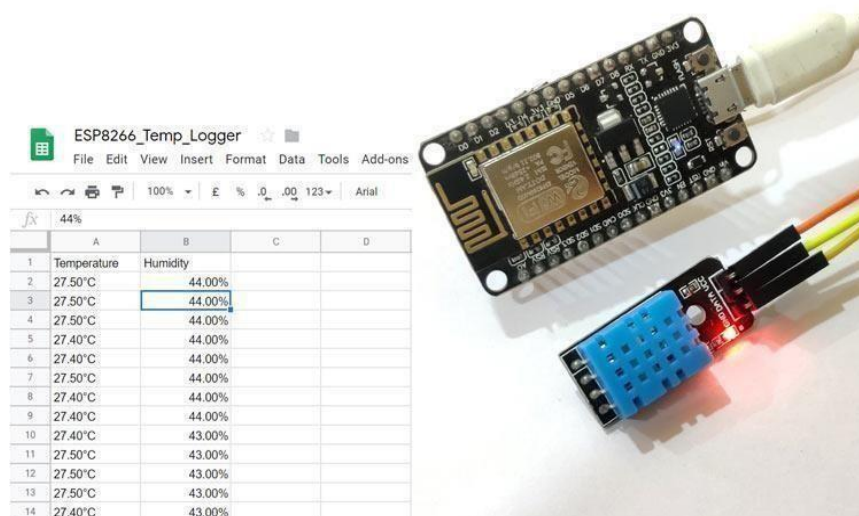


Fig 1.4 – Temperature Data Logger to Google sheets

The 3-phase power was subsequently reconnected, and reports were properly relayed here to local Lcd, network infrastructure, and predetermined cell phone numbers once more. Aside from volt readings, the position of the power outage was effectively shown on the virtualized environment and on a phone. When compared to the real location of the lab setting, the position was likewise judged to be right. The cloud platform also displayed the date and duration of the power outage. The start time, finish time, and period of the blackout presented on the virtualized environment was confirmed to be true when compared to a GPS-synchronized timestamp. To see if the voltage readings reported on the Screen are correct.

1.4 Scope of the project

The brownout detector feature is enabled via a volt detector wherein the voltage is recently resigned over 230V AC to 12 V AC, rectified, and utilized as a Microcontroller entry of roughly 2V DC. Whenever the provision is lost, an Arduino's 2V DC input would become 0, as well as the encapsulated program in the Embedded system and Atmega microcomputer needs to send an Instant notification to a predetermined phone by using able to connect ESP-32 over the wireless router, containing information about the condition of the source first from 3 phases or the power surge placement. Simultaneously, a program on the cloud host is executed via an instruction U Target server to analyze the blackout Import the information and position of the power interruption into the database server for retention and presentation on the virtualized environment. Three voltage transformers scale down the ac Mains voltage value from the R, Y, B phases to 12V Ac voltage in the voltage sensor module. A bridge rectifier converts alternating current to direct current and a voltage splitter guarantees that the Microcontroller panel's analog signal ports get about 2V DC. The volt measurements out from the device are transformed to a range between 0 and 1023 by the analog signal pins, which will then be reconverted to volt levels for showing on the Display

and network infrastructure. When any of the 3 phases loses power, the outcome The integrated program in the Microcontroller senses the interruption of power and transmits alerts to the server and a predetermined phone when the power feed to the Microcontroller is lost. The Microcontroller may communicate the volt difference between the 3 phases to the cloud infrastructure via an integrated software calculation. The public cloud also shows the date and time of the alert messages. The primary wire harness is shown in Figure 3.1 Aside from the voltage sensor circuit, the main board circuit is powered by an LM7805 regulator that keeps the 5 Volt input value constant. There's also an energy management circuitry that manages the device's charge, as well as a Display screen.



Fig 1.5 – Expected Mobile Interface View

CHAPTER 2

LITERATURE SURVEY

The following shows a survey done for a smart Vehicle parking System through MQTT broker service automation for with and without internet on Realtime which includes an instant feedback mechanism that drives the exact slot appliances. This system is reliable to integrate on multiple platforms with the help of ESP32 master which serves as standard firmware. Further, the study was extended to multiple operation platforms like Linux, Windows, and IOS are discussed as follows. In this detailed survey, we have learned a lot in stabilizing our concepts from the existing feedback mechanisms that were designed in the previous study

Satyendra K. Vishwakarma, Prashant Upadhyaya, Babita Kumari, and Arun Kumar Mishra, IJSR “Smart Energy Efficient Home Automation System Using IoT”, IJSR Transaction on Computer Science Engineering 2021.

This paper presents a step-by-step procedure of a smart home automation controller. It uses IoT to convert home appliances to smart and intelligent devices, with the help of design control. An energy-efficient system is designed that accesses the smart home remotely using IoT connectivity. The proposed system mainly requires, Node MCU as the microcontroller unit, IFTTT to interpret voice commands, Adafruit a library that supports MQTT acts as an MQTT broker, and Arduino IDE to code the microcontroller.

This multimodal system uses Google Assistant along with a web-based application to control the smart home. The smart home is implemented with the main control unit that is connected to the 24-hour available Wi-Fi network.

To ensure, that the WiFi connection does not turn off, the main controller is programmed to establish an automatic connection with the available network and connected to the auto power backup.

Pros: The target scaling factor is efficient throughout the multiple platforms switching 9

Cons: Slower transit cycles when compared to CoAP, low scalability, and lack of security encryption

Shardha Somani, Parikshit Solunke, Shaunak Oke, Parth Medhi. Prof. P. P. Laturkar, IEEE “IoT Based Smart Security and Home Automation”, IEEE Transactions on Augmented Reality, 2021

This paper focuses on a system that provides features of Home Automation relying on IoT to operate easily, in addition to that it includes a camera module and provides home security. The android application basically converts smartphones into a remote for all home appliances. Security is achieved with motion sensors if movement is sensed at the entrance of the house; a notification is sent that contains a photo of the house entrance in real-time. This notification will be received by the owner of the house via the internet such that the app can trigger a notification. So, the owner can raise an alarm in case of any intrusion or he/she can toggle the appliances like opening the door if the person is a guest. The system uses Raspberry Pi, a small-sized computer that acts as a server for the system. The smart home consists of two modules. Home automation consists; of a fanlight and door controller, and a security module that consists; of a smoke sensor motion sensor, and camera module.

Pros: Implementation of IR Interface was an excellent Idea for creating universal remote

Cons: The system Uses Infrared Radiation for data transfer which is much faster than Coap but could be easily mapped with 38 kHz of regular frequency

Tui-Yi Yang, Chu-Sing Yang, IJEEE “A Dynamic Distributed Energy Management Algorithm of Home Sensor Network for Home Automation System”, IJEEE Transactions on Electrical and Electronics Engineers, 2017

This paper proposes an optimization of home power consumption based on PLC (Power Line Communication) for an easy-to-access home energy consumption. This also proposes a Zigbee and PLC-based renewable energy gateway to monitor the energy generation of renewable energies. ACS and DDEM algorithms are proposed for the design of intelligent distribution of power management systems to make sure ongoing power supply of home networks. To provide efficient power management the power supply models of home sensor networks are classified into groups viz. main supply only, main supply and backup battery, rechargeable battery power, and nonrechargeable battery power. Devices with particular features are assigned to these groups. It targets establishing a real-time processing scheme to address variable sensor network topologies.

Pros: Fast and secured since the data encryption is 64bit ratio and it follows MQTT protocol

Cons: Does not support a large database size, and it has no support for ROLE, COMMIT, and Stored Procedures

Tushar Chaurasia, and Prashant Kumar Jain “Enhance Smart Home Automation System based on Internet of Things”, Transactions on Artificial Neural Networks, 2019

This paper proposes a system that develops a model to reduce the computation overhead in existing smart home solutions that use various encryption technologies like AES, ECHD, hybrid, etc. these solutions use an intermediate gateway for connecting various sensor devices. The proposed model provides a method for automation with sensor-based learning.

The system uses temperature sensor for development but other sensors can also be used as per requirement. These smart home devices with sensors can configure themselves autonomously and can operate without human intervention. This work minimizes encryption decryption and focuses on authentication and automation of smart home devices with learning. The system bypasses the local gateway mentioned in the existing system to provide better security for smart home devices and sensor data and save computation overhead. The real-time broker cloud is directly connected with the smart home and manages all incoming and outgoing requests between users and devices. The main purpose to use a real-time broker cloud saves time for cryptographic operations.

Pros: Bringing AR with Deep Neural schema is an Excellency and this system can be integrated with the 7 senses of the future world.

Cons: It has a range of support between 3.5Hz to 75Hz which in turn directly matches the neural frequency that potentially messes up sensory organs.

Suraj, Ish Kool, Dharmendra Kumar, Shovan Barman “Visual Machine Intelligence for Home Automation”, MDPI Transactions on Applied Science, 2020

The paper presents a vision-based machine intelligence system to sense the on/off state of common home appliances. The proposed method of sensing the state of appliances results in a novel home automation system. The accessibility of the suite of devices in the home over a remote network is facilitated by the IP Addressing methods in the IoT. This project uses two boards viz. Raspberry Pi and Intel Galileo Gen 2. The communication between the User devices, Raspberry Pi, and the Intel Galileo boards happens over a wireless network. The UDP protocol is deployed to facilitate the wireless communication of the nodes present in the home automation network. A Pi Cam and a US Logitech camera are attached to the rotating shaft of two different servo motor capture snapshots that are passed as inputs to the Machine Learning based models trained using dlib-C++ to detect the state of the operation of the appliances.

The proposed method uses visual modality to automate the appliances, as privacy concerns may emerge while using the images from some specific places, as a counter to this issue, an SPDT switch is added to the Raspberry Pi which when turned off ensures that even if the images are taken from the webcams, they are just passed as inputs to the machine learning models and are not displayed on the website when the users access the website on the server address obtained from Raspberry Pi.

Pros: High Visual and Artificial Database was integrated which can be a link between and virtual and physical world. A creative contextual database has a created a huge responsive factor

Cons: Superimposing virtual environmental capacity has no range of lower frequency AR camera support

Vikram N, Harish KS, Nihaal M S, Raksha Umesh, and, Shetty Asshik Ashok Kumar, “A Low-Cost Home Automation System using Wi-Fi-based Wireless sensor Network incorporating Internet of things”, Procedia Computer Science Transactions on Mobile Device, 2015

This paper illustrates a methodology to provide a low-cost Home Automation System (HAS) using Wireless Fidelity (Wi-Fi). This crystallizes the concept of internetworking of smart devices. A WiFi-based Wireless Sensor Network (WSN) is designed for the purpose of monitoring and controlling the environmental, safety, and electrical parameters of a smart interconnected home. The different sections of the HAS are; the temperature and humidity sensor, gas leakage warning system, fire alarm system, burglar alarm system, rain-sensing, switching and regulation of load & voltage, and current sensing. The primary requirement of HAS to monitor and control devices is accomplished using a Smartphone application. The application is developed using Android Studio

based on the JAVA platform and the User Interface is exemplified. The primary focus of the paper is to develop a solution cost-effective and flexible in the control of devices and implements a wide range of sensors to capture various parameters.

Pros: Implementing a local server reduces cognitive allocation in the server.

Cons: Error Factors are high since it is purely based on local server data.

Mrs. Paul Jasmin Rani, Jason Bakthakumar, Praveen Kumar B, Praveen Kumar U. Santhosh Kumar. “Voice Controlled Home Automation System using Natural Language Processing and Internet of Things”, INCC Transactions on National Security Science and Computation, 2018

The paper focuses on the construction of a fully functional voice-based home automation system that uses the Internet of Things, Artificial Intelligence, and Natural Language Processing (NLP) to provide a cost-effective, efficient way to work together with home appliances using various technologies such as GSM, NFC, etc. it implements a seamless integration of all the appliances to a central console, i.e., the mobile device. The prototype uses Arduino MK1000, known as Genuine MK1000. The NLP in this project gives the user the freedom to interact with the home appliances with his/her own voice and normal language rather than complicated computer commands. The appliances are connected to the mobile device through an Arduino Board that establishes the concept of the Internet of Things. The Arduino Boards are interfaced with the appliances and programmed in such a way that they respond to mobile inputs.

Pros: Only a few notable parameters throughout the project

Cons: The rate of prediction is proportionally less when compared to real-world predictions

Jonathan J. Hull, Berna Erol, Jamey Graham, Qifa Ke, Hidenobu Kishi, Jorge Moraleda, Daniel G. Van Olst, Research Gate “Paper-Based Augmented Reality”, Research Gate Transaction on Camera and Paper documentation, 2014

A new method for augmenting paper documents with electronic information is described that does not modify the format of the paper document in any way. Applicable to both commercially printed documents as well as documents that are output from PCs, the technique we call Paper-Based Augmented Reality substantially improves the utility of paper. We describe the recognition technology that makes this possible as well as several applications. An implementation on a camera phone is discussed that lets users retrieve data and access links from paper documents to electronic data. Recognition is performed at 4 frames per second on a Treo 700w and support is provided for several user applications, including “clickable paper” – printed web pages whose appearance is unchanged but that can be navigated with a camera phone.

Pros: Augmented reality with virtual automation was brought to the physical world with the paper content

Cons: Linking patches of text will increase a lot of security reasons

Mikko Kytö^{1,2}, Barrett Ens², Thammathip Piumsomboon², Gun A. Lee², and Mark Billingham², Research Gate “Pinpointing: Precise Head- and Eye-Based Target Selection for Augmented Reality”, Research Gate Transactions on Augmented Reality in Computer Science Engineering, 2018

Head and eye movement can be leveraged to improve the user’s interaction repertoire for wearable displays. Head movements are deliberate and accurate and provide the current state-of-the-art pointing technique. Eye gaze can potentially be faster and more ergonomic but suffers from low

accuracy due to calibration errors and the drift of wearable eye-tracking sensors. This work investigates precise, multimodal selection techniques using head motion and eye gaze. A comparison of speed and pointing accuracy reveals the relative merits of each method, including the achievable target size for robust selection. We demonstrate and discuss example applications for 15 augmented realities, including compact menus with deep structure, and a proof-of-concept method for online correction of calibration drift.

Pros: Accuracy has reached 97% with a simple algorithm

Cons: 97% precise and accurate but depends purely on real-time saturation and hue point of target images

**Subramani Roy Choudri, A. Divija, G. V V N Vijayalakshmi, P. Vamsi, JARTMS
“TOUCHLESS HOME AUTOMATION USING AUGMENTED REALITY”, JARTMS
Transactions on Augmented Reality and Web Interface, 2021**

As human life is heading towards a busy schedule it becomes necessary to automate our home appliances. Human error is something that cannot be completely erased. With the busy schedule in hand, there is defiantly a possibility of missing something that may be trivial to us but can result in a catastrophe. For these reasons, Our Project home automation can increase efficiency, security, and reliability. AR has recently evolved for the automation of various electrical appliances by popping virtual objects into the real world.

Pros: Target Image can be linked to the Virtual world

Cons: Target Image can be linked-to automation with an augmented environment but in the case of wet hands, this linking process will not produce tokens to respective server

CHAPTER 3

EXISTING AND PROPOSED METHODOLOGY

3.1 Existing Methodology

We have a lot of devices that support data transmission via IoT, but some specific system of effective monitoring was not taken into account. Here we have people design the system with effective coding staggering that serves the reliable data over the cloud. If there was a power failure existing failed to notify the users that because of this specific reason packet loss happened. Hence, we focus mainly on the improvement of the existing system YX850 shifting process circuit to make the proposed system reliable and effective

3.2 Proposed Methodology

This proposed system is based on two phases, the Power distribution monitoring phase and data uplink on google sheet phase. Based on the current system failure and upgrading conditions system will be reliable. So we focused on power systems rather than data loggers. When the system face power failure YX850 module will alert the distribution relay with a feedback signal that commutates with the battery part and reaches the server database and will be notified to the end user. Data from the sensors will be shifted to google sheets in an excel format as discussed earlier

This review presents an overview of the study methodology as well as an overview of such data collection techniques. The proposed work began with a primary survey, the results of which were utilized to create an outage monitoring methodology and a concept dependent on it. The observational, interpretive, and hydraulic slide program development inquiry approaches were used in this study.

An experimental plan is a detailed method defined as the problem-solving period of study in which the researcher concentrates on the report's scope while anticipating challenges at a later time. The difficulties encountered by the supplier and indeed the energy customers in notifying and mitigating outages were investigated using qualitative and observational studies. A sample for monitoring and communicating power dissipation was developed using an iterative waterfall systems integration academic practice.

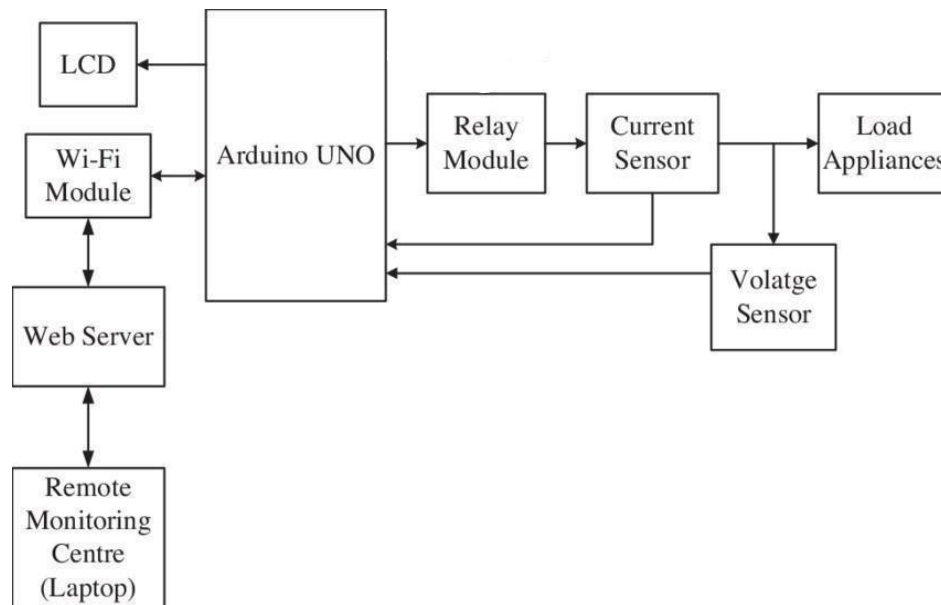


Fig 3.1 – System Block Diagram for Monitoring Power Status

Data sets and selection: The material for this inquiry was gathered from both internal and external sources. Systematic review materials on the issue, including manuals, key periodicals, papers, published technical articles, and documentation, were used as secondary resources. And from the other end, the main data comprised questioning surveys with the power network operator and power customers. Workers from Different points in the process which serve as in Help Desk service team, Problem Co-coordinators, and power clients in the area were the report's target demographic. People who utilize power call center staff and fault monitors were chosen in this study. These information-gathering tools included both open-ended and closed-ended queries. The researcher planned to gather and analyze answers as a result of this.

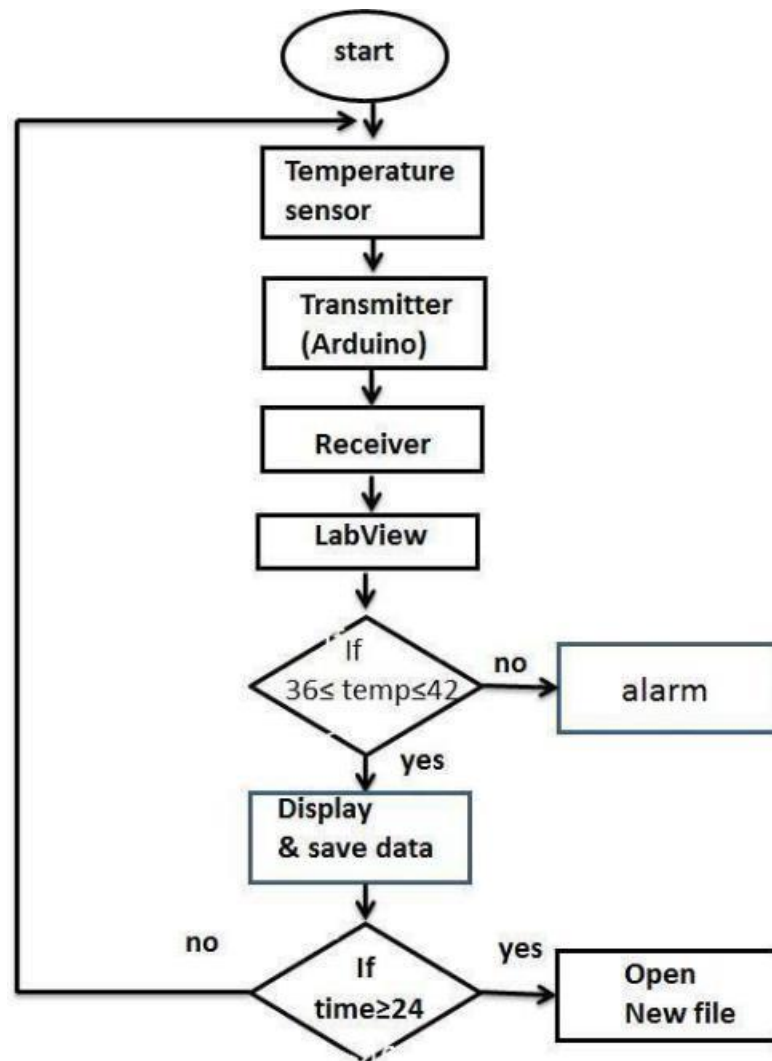


Fig 3.2 – System Flow Chart Diagram for Monitoring Power Status

The experts were chosen using a Convenient sampling Sample technique since the goal was to find people who were familiar with present brownout reports images. Nonetheless, a stratified cluster survey strategy was used to pick power users, with regional communities being chosen.

Later afterward, a survey design was used, wherein residences were chosen for the survey form. The size of the sample was determined using the stratified sampling approach, which maintains a curvature of relative relations among populations and matches data points with a confidence interval. The number of participants was assessed to be 383. Data Collection. The data for Sociologists was used to enter and evaluate quantifiable data gathered from participants. Statistics were used in quantification, which was presented in columns and data sets. However, a stratified random sampling process was used to choose the power users, with province communities being chosen by simple sample choice. After that, survey design was used to pick houses for the distribution of the questionnaires. The survey research method was determined using a sample selection approach, which is based on a graph of correlation variables among demographic and samples.

3.3 ESP8266

The ESP8266 is a low-cost Wi-Fi-enabled microchip with a full TCP/IP stack and microcontroller capability. NodeMCU includes a CPU core, faster Wi-Fi, more GPIOs, and supports Bluetooth 4.2, and low-power Bluetooth. As soon as the IR sensors get the presence of a car in front of the entrance, it will send a signal to the NodeMCU to check if there is an empty slot inside the parking lot. When NodeMCU acknowledges that there is an empty slot or more then it will send a signal to the dc servo motor which will open the main entrance. On the other hand, if a NodeMCU encounters no empty slots at the time of a car trying to make an entrance, the gate will just not open. In addition, there will be a website linked with the NodeMCU board to show the number of parking.

The idea behind our methodology is very simple, usually, users spend most of their time looking for an empty slot where they can park their vehicle which increases fuel consumption and time wastage. We came up with a new method where we provide the user with an empty slot number where he can park his vehicle without wasting his time for finding one.

Similarly, we try to display the start time and end time so that the user can know for what amount of time he has parked his vehicle.

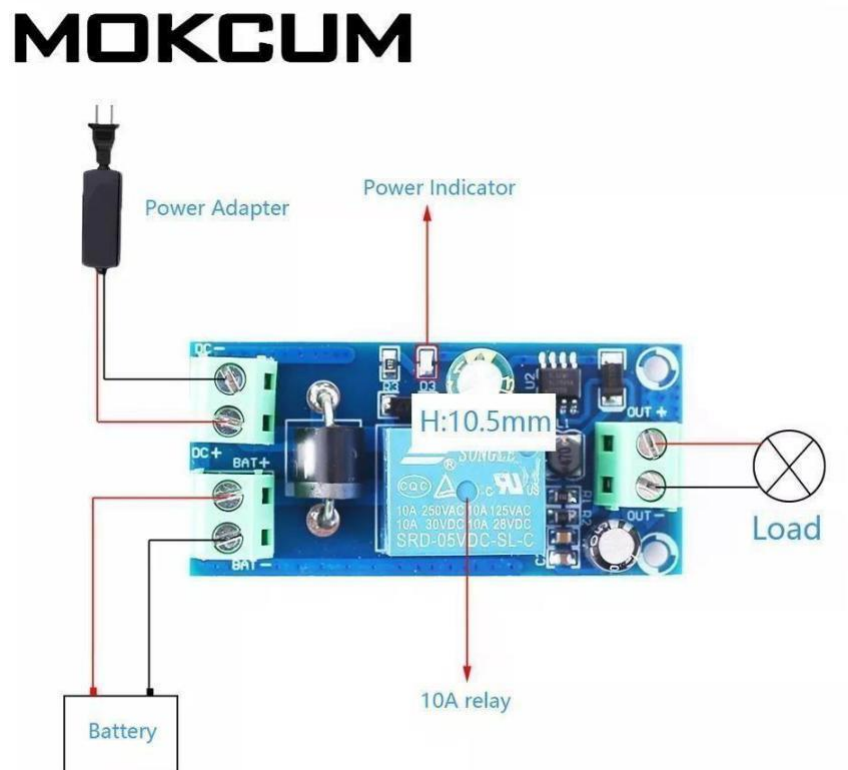


Fig 3.3 – YX850 Power Failure Diagram

Vehicle occupancy detection and management of parking lots. Most of the smart parking systems (SPS) proposed in literature over the past few years provide a solution to the design of parking availability information systems, parking reservation systems, occupancy detection and management of parking lot, real-time navigation within the parking facility, etc. However, very few works have paid attention to the real-time detection of improper parking and the automatic collection of parking charges. Thus, this paper presents an internet-of thing (IoT) based E-parking system that employs an integrated component called a parking meter (PM) to address the following issues.

- Real-time detection of improper parking
- Estimation of each vehicles duration of parking lot usage
- Automatic collection of parking charges

the E-parking system proposed in this paper also provides a city-wide smart parking management solution via providing parking facility availability information and parking lot reservation system and it is named as parking meter (PM) based E-parking (PM-EP)

3.4 DHT11

DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a highperformance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness.

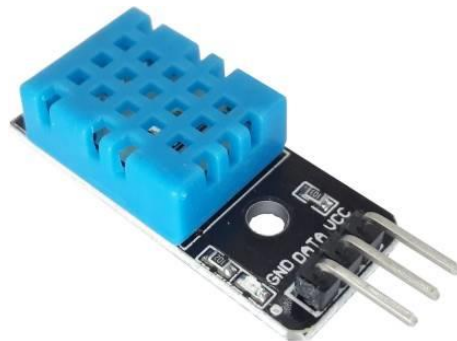


Fig 3.4 DHT temperature and humidity sensor

Each DHT11 element is strictly calibrated in the laboratory that is extremely accurate on humidity calibration. The calibration coefficients are stored as programmes in the OTP memory, which are used by the sensor's internal signal detecting process. The single-wire serial interface makes system integration quick and easy. Its small size, low power consumption and up-to-20 meter signal transmission making it the best choice for various applications, including those most demanding ones. The component is 4-pin single row pin package. It is convenient to connect and special packages can be provided according to users' request.

Parameters	Conditions	Minimum	Typical	Maximum
Humidity				
Resolution		1%RH	1%RH	1%RH
			8 Bit	
Repeatability			$\pm 1\%RH$	
Accuracy	25°C		$\pm 4\%RH$	
	0-50°C			$\pm 5\%RH$
Interchangeability	Fully Interchangeable			
Measurement Range	0°C	30%RH		90%RH
	25°C	20%RH		90%RH
	50°C	20%RH		80%RH
Response Time (Seconds)	1/e(63%)25°C, 1m/s Air	6 S	10 S	15 S
Hysteresis			$\pm 1\%RH$	
Long-Term Stability	Typical		$\pm 1\%RH/\text{year}$	
Temperature				
Resolution		1°C	1°C	1°C
		8 Bit	8 Bit	8 Bit
Repeatability			$\pm 1^\circ C$	
Accuracy		$\pm 1^\circ C$		$\pm 2^\circ C$
Measurement Range		0°C		50°C
Response Time (Seconds)	1/e(63%)	6 S		30 S

Fig 3.5 DHT Sensor Specifications

3.5 Hi-Link AC DC Converter

HLK-20M24 Hi-Link 24V 20W AC to DC Power Supply Module is a plastic enclosed PCB mounted isolated switching step-down power supply module. It can supply 24V DC from 100V AC to 240V AC and has a power rating of 20 Watt. This makes it perfect for small projects that need a 24 volt supply from mains. There are many advantages to these modules, such as low-temperature rise, low power, high efficiency, high reliability, high-security isolation, etc.

The 20W ultra-small series power supply module is a small volume, high-efficiency power module for customers designed by Hi-Link. It has the advantage of the global input range, low-temperature rise, low power consumption, high efficiency, high reliability, etc. It has been widely used in smart homes, automation control, and other industries.



Fig 3.6 Hi-Link Power supply module

This Power Supply Module voltage source is a switching source, so you do not have to worry about fluctuations in the voltage grid. It is designed to be mounted on the PCB and is the ideal solution to power pads that you take. It is widely used in a smart homes, automation and control, communication equipment, instrumentation, and other industries.

Features of Hi-Link AC DC Powersupply Module

1. Meet UL, CE requirements,
2. Ultra-thin, ultra-small
3. All voltage input (AC: 100 ~ 240V)
4. Low ripple and low noise
5. Output overload and short circuit protection
6. High efficiency, high power density
7. The product is designed to meet the requirements of the EMC and Safety Test
8. Low power consumption, environmental protection, no-load loss <0.1

3.6 Voltage Sensor

This sensor is used to monitor, calculate and determine the voltage supply. This sensor can determine the AC or DC voltage level. The input of this sensor can be the voltage whereas the output is the switches, analog voltage signal, a current signal, an audible signal, etc. Some sensors provide sine waveforms or pulse waveforms like output & others can generate outputs like AM (Amplitude Modulation), PWM (Pulse Width Modulation) or FM (Frequency Modulation). The measurement of these sensors can depend on the voltage divider.

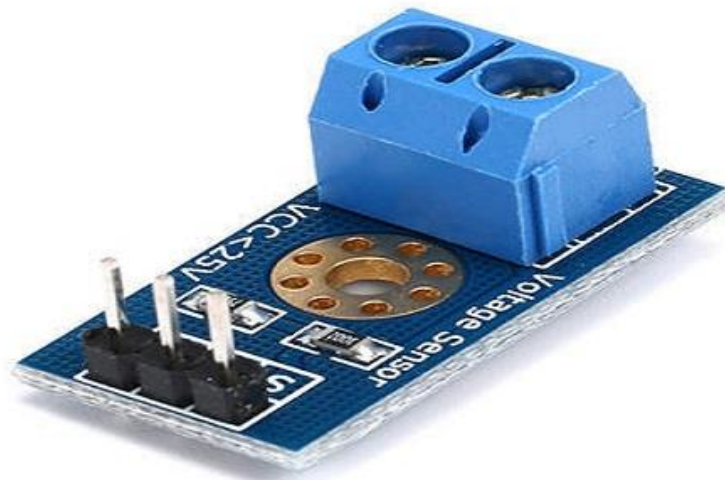


Fig 3.7 Voltage Sensor

This sensor includes input and output. The input side mainly includes two pins namely positive and negative pins. The two pins of the device can be connected to the positive & negative pins of the sensor. The device positive & negative pins can be connected to the

positive & negative pins of the sensor. The output of this sensor mainly includes supply voltage (Vcc), ground (GND), analog o/p data.

3.7 Voltage Regulator

A voltage regulator is a system designed to automatically maintain a constant voltage. A voltage regulator may use a simple feed-forward design or may include negative feedback. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages.



Fig 3.8 Voltage Regulator

Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant. In an electric power distribution system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line.

3.8 SPDT Switches

The simplest form of a switch is an SPST switch. An SPST switch embraces a basic "ON/OFF" control of a single circuit and consists of two terminals that serve as electrical connection points. Power the switch "ON" to establish a connection between the two terminals. Turn the switch to "OFF" to eliminate the terminals' connection.



Fig 3.9 SPDT Switches

The light switch in the room you're in right now probably uses an SPST switch. When in the "OFF" position, the circuit breaks and the light turns off. When the switch is set to "ON," the two connected terminals complete the circuit and the light turns on.

An SPDT switch consists of three terminals and connects the source terminal and one of two output terminals. An SPDT switch allows for an "ON/ON" configuration, which means the switch's input terminal is always completing one of the two possible circuits that the switch controls.

- If the switch is in the "ON-1" position, the connection between the input terminal is established with the first output terminal, thus completing the first circuit.
- If the switch is set to "ON-2," the second output terminal establishes the connection with the input terminal, thus completing the second circuit.

Since both circuit options rely on the input terminal, this switch is a single pole switch because only one completed circuit can exist at any given time. Confusingly, a third configuration exists for some SPDT switches. This third switch can be set to an "OFF" status in which neither circuit one or two is complete. This SPDT switch configuration is noted as "ON/OFF/ON".

3.9 PIEZO Electric Buzzer

A Piezo buzzer is a type of electronic device that's used to produce a tone, alarm or sound. It's lightweight with a simple construction, and it's typically a low-cost product. Yet at the same time, depending on the piezo ceramic buzzer specifications, it's also reliable and can be constructed in a wide range of sizes that work across varying frequencies to produce different sound outputs.



Fig 3.10 Electric Buzzer

For instance, at APC International, Ltd., we offer piezo buzzers without signal generators, self-oscillating buzzers that have signal generators and even multi-tone sound generators — often used in alarms and sirens. Regardless of the model you choose, our piezo buzzers offer high sound outputs. Plus, since they can be mounted on circuit boards, they're highly useful in a wide range of applications and assemblies.

Despite different construction methods that affect the cost of piezo buzzers, all of our prices are highly competitive. In addition, thanks to our state-of-the-art production facility, our delivery times are some of the fastest in the industry.

3.10 Protection Diodes

A protection diode is a type of Zener diode. Zener diodes can be used not only as protection diodes but also as constant-voltage regulators. Protection diodes are specifically designed to protect electronic circuits from ESD and other transient pulses. In contrast, Zener diodes for constant-voltage regulation remain conducting in breakdown mode

Protection diodes are used as voltage clampers for surge protection. These diodes are designed to conduct in the event of excessive voltage being applied to a circuit.

A protection diode used in any circuit that allows the flow of current in the forward direction, because the current will not flow in the reverse direction. It protects the components which are responsive to the flow of current through them in the wrong direction.

A protection diode used in a circuit is shown below. The following circuit is built with a protection diode to protect the circuit. For instance, the following project uses a protection diode that is connected in series with a light-emitting diode. An LED is pretty responsive to current in the reverse direction. It can only knob a certain amount of current in the incorrect direction. If sufficient reverse voltage drops across the LED then it will break down and let current to flow through it in the reverse direction, which can root the LED to be lastingly damaged.

The circuit below shows how a protection diode lets the flow of current in the forward direction and blocks the flow of current in the reverse direction. This provides to protect devices in a circuit that could be smashed from reverse current flow. Even though the following circuit provides protection through a diode, there is another way to use this protection diode in a circuit. The circuit below is a protection diode used in a circuit.

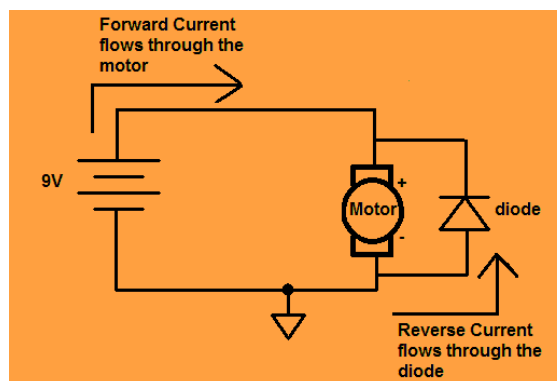


Fig 3.11 Protection Diode Circuit

To keep a component safe in a circuit, a protection diode is normally located in reverse bias in parallel with the other component. Whenever a diode is positioned in parallel with the element you want protected reverse biased, if the flow of current through the circuit is in reverse, then the current flows through the diode, go around the motor. With huge amounts of current, some current may still pass through the motor, but it will be split

between the diode and the motor. Therefore, all of the current will not flow through the motor, as would be the case if there was no diode present.

3.11 Transistors

A transistor is a semiconductor device used to amplify or switch electrical signals and power. It is one of the basic building blocks of modern electronics.[1] It is composed of semiconductor material, usually with at least three terminals for connection to an electronic circuit. A voltage or current applied to one pair of the transistor's terminals controls the current through another pair of terminals. Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Some transistors are packaged individually, but many more in miniature form are found embedded in integrated circuits.

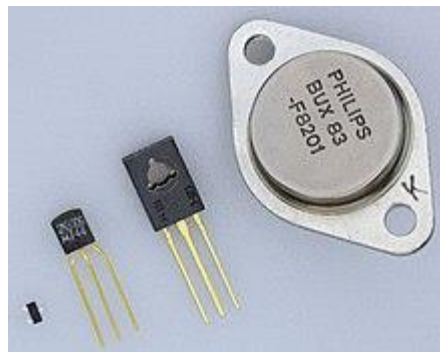


Fig 3.12 Transistors

Physicist Julius Edgar Lilienfeld proposed the concept of a field-effect transistor in 1926, but it was not possible to construct a working device at that time.[2] The first working device was a point-contact transistor invented in 1947 by physicists John Bardeen and Walter Brattain, working under William Shockley at Bell Labs; the three shared the 1956 Nobel Prize in Physics for their achievement.[3] The most widely used type of transistor is the metal–oxide–semiconductor field-effect transistor (MOSFET), invented by Mohamed Atalla and Dawon Kahng at Bell Labs in 1959.[4][5][6] Transistors revolutionized the field of electronics and paved the way for smaller and cheaper radios, calculators, computers, and other electronic devices.

Most transistors are made from very pure silicon, and some from germanium, but certain other semiconductor materials are sometimes used. A transistor may have only one kind of charge carrier, in a field-effect transistor, or may have two kinds of charge carriers in bipolar junction transistor devices. Compared with the vacuum tube, transistors are generally smaller and require less power to operate. Certain vacuum tubes have advantages over transistors at very high operating frequencies or high operating voltages. Many types of transistors are made to standardized specifications by multiple manufacturers.

3.12 Jumper Wires

Jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.



Fig 3.13 Jumper Wires

There are different types of jumper wires. Some have the same type of electrical connector at both ends, while others have different connectors. Some common connectors are:

Solid tips – are used to connect on/with a breadboard or female header connector. The arrangement of the elements and ease of insertion on a breadboard allows increasing the mounting density of both components and jump wires without fear of short-circuits. The jump wires vary in size and colour to distinguish the different working signals.

- Crocodile clips – are used, among other applications, to temporarily bridge sensors, buttons and other elements of prototypes with components or equipment that have arbitrary connectors, wires, screw terminals, etc.
- Banana connectors – are commonly used on test equipment for DC and low-frequency AC signals.
- Registered jack (RJnn) – are commonly used in telephone (RJ11) and computer networking (RJ45).
- RCA connectors – are often used for audio, low-resolution composite video signals, or other low-frequency applications requiring a shielded cable.
- RF connectors – are used to carry radio frequency signals between circuits, test equipment, and antennas.
- RF jumper cables - Jumper cables is a smaller and more bendable corrugated cable which is used to connect antennas and other components to network cabling. Jumpers are also used in base stations to connect antennas to radio units. Usually the most bendable jumper cable diameter is 1/2".

3.13 Blynk IoT Platform

Blynk is an IoT (Internet of Things) platform that allows developers and hobbyists to create mobile applications that can control and monitor connected devices. The platform consists of a mobile app, a cloud-based server, and a library of software that runs on microcontrollers like the Arduino and the Raspberry Pi.

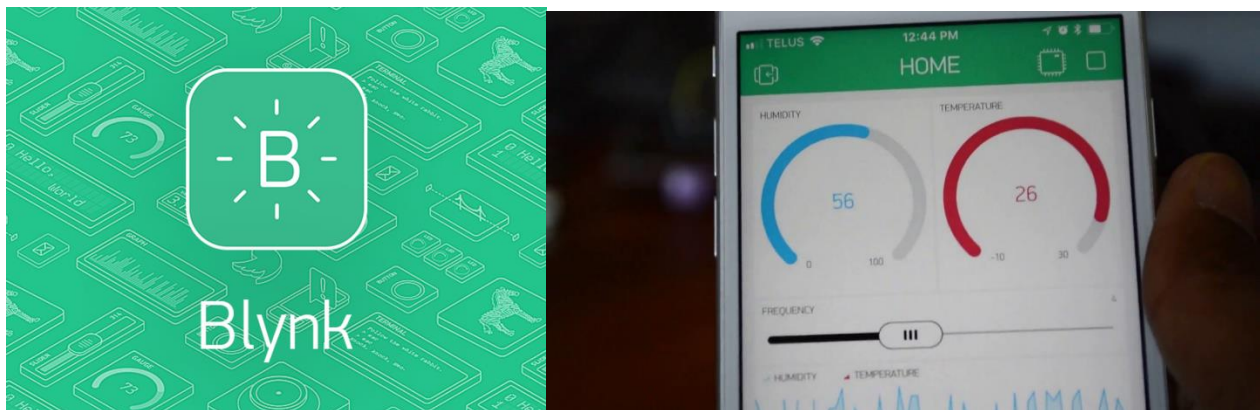


Fig 3.14 Blynk Mobile Application

With Blynk, users can easily create custom user interfaces for their IoT projects without needing to write any code. The mobile app provides a drag-and-drop interface that allows users to add buttons, sliders, and other widgets to control their devices. The cloud-based server handles communication between the mobile app and the microcontroller, allowing users to remotely control and monitor their devices from anywhere in the world.

Overall, Blynk is a powerful and easy-to-use platform that makes it easy for developers and hobbyists to build and control IoT projects. Whether you are building a simple home automation system or a complex industrial IoT solution, Blynk has the tools and resources you need to get started.

3.14 Functionality of Proposed work

The Project "Development of temperature and power failure event monitoring system for hospital cold storages using IoT and Cloud" involves creating a monitoring system that utilizes Internet of Things (IoT) and Cloud technologies to keep track of temperature and power failures in hospital cold storages.

Here is a working procedure for the project:

Define the project scope: The first step is to define the project scope, including the requirements and objectives of the monitoring system. This should involve consulting with hospital staff to understand their specific needs and challenges related to cold storage management.

Identify the hardware and software components: The next step is to identify the hardware and software components needed to build the monitoring system. This includes IoT sensors, gateways, cloud infrastructure, and monitoring software.

Design of system architecture: Once the components have been identified, it is necessary to design the system architecture. This involves determining how the sensors will be placed in the cold storage rooms, how the data will be transmitted to the cloud, and how the monitoring software will process and display the data.

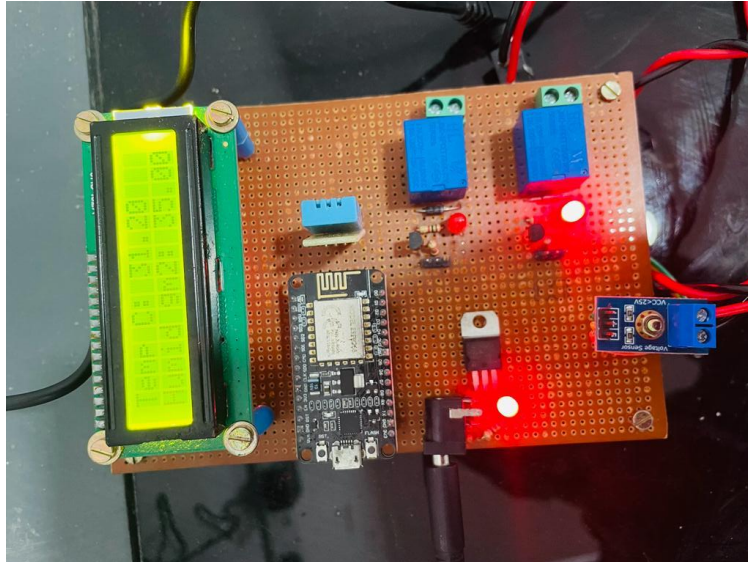


Fig 3.15 Working picture of project

As shown in the fig. 3.15 When the equipment is placed in a room and providing the power supply, the temperature and humidity sensor should sense the room condition and it has to be displayed in a lcd screen. Then coming to the power sensor an adopter has to be connect to the board and to the socket.

In this we are using two relays to show the power is off or on. When the power is off relay 2 will be glown and as soon as possible within 10 sec the user will get alert notification. if when the power is on the relay 1 will be glown and again the user get a notification.

We are using blynk IoT web server to know the alert notifications. We have to download the blynk iot app and then we have to create a login user id and password to open the app. for every 3min we will get a notification to the app. it will show the temperature, humidity and power values. in this we are using the cloud platform.

Once the system has been tested and verified, it can be deployed in the hospital cold storage rooms. This involves installing the sensors, gateways, and monitoring software, and configuring the system to send alerts to the user when temperature or power failures occur.

The main aim of the project is to know the power failures in hospitals and cold storages. When the power is off immediately the user have to get a signal or notification alert through sms or mail. Finally, it is necessary to train hospital staff on how to use the monitoring system and provide ongoing support as needed.

CHAPTER 4

CONCLUSION

Power surge notifications are transmitted to the cell phone and internet service in a couple of seconds in the conceptual framework and sample, which is far better than allowing the client to report the incident. When implemented, this technology would enhance reaction times to outages and shorten system outages by automatically reporting power outages to utility staff through the web and cell phones. Improve reaction times to power outage notifications and shorten system outages by automatically reporting power outages to utility staff through the cloud and mobile phone. Ensure that the service operator uses the internet to manage the reduced output network and keep a record of power outages. Reduce pressure on customer service to relieve customers of the stress of notifying power outages. Allow field staff to obtain power cut data via the virtualized environment. According to the findings, managing the brownout review system is desired, and hence this technology must be completely established to reap its extra value. Further, all the values from the I2C temperature sensor will be shifted to google sheets in an excel format with a live update

4.1 Future Scope:

Our proposed system is a basic designed architecture for precise data management on medical sector storage units. There might be a false play of hacking the data from the servers. Hence, we suggest that further upgradation of the project must be protected against hackers. Since our system is not reliable to handle large data support from the internet against hackers. We follow secured MQTT protocol but this system is an open-source platform and can be cracked by the tech persons based on the threading process .

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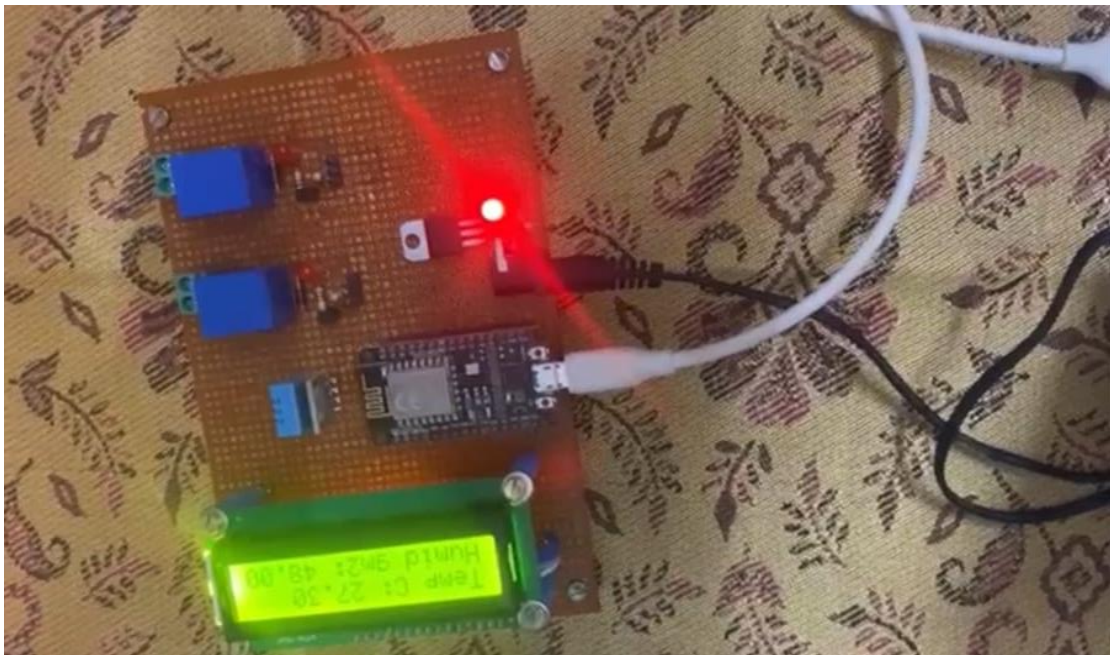
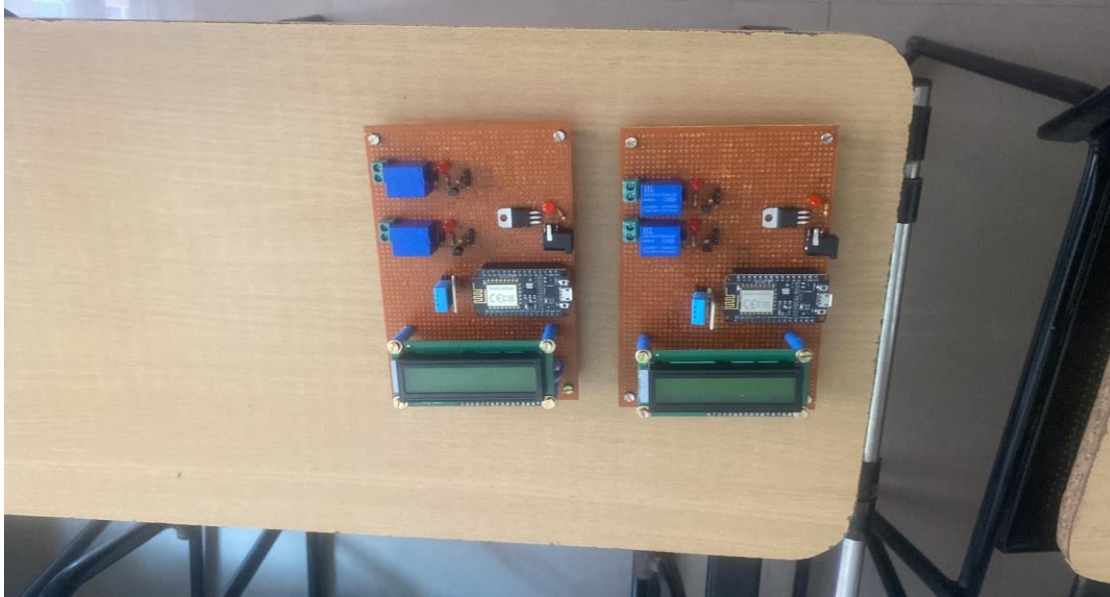
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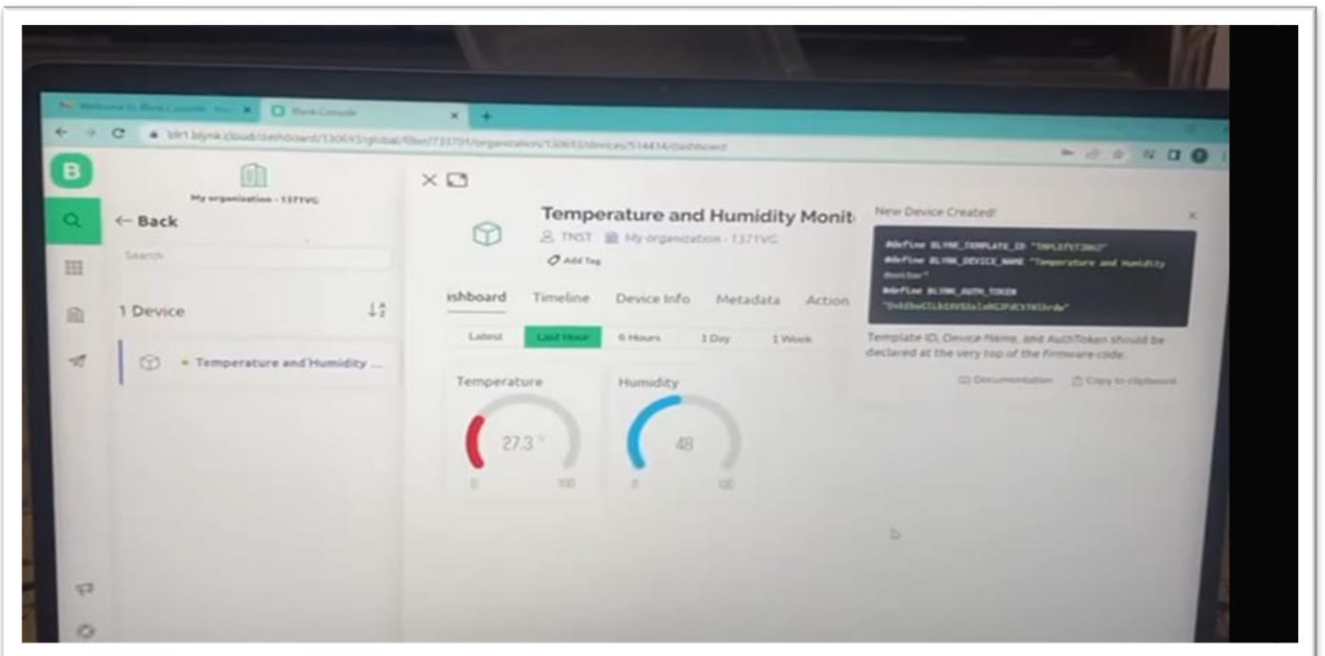
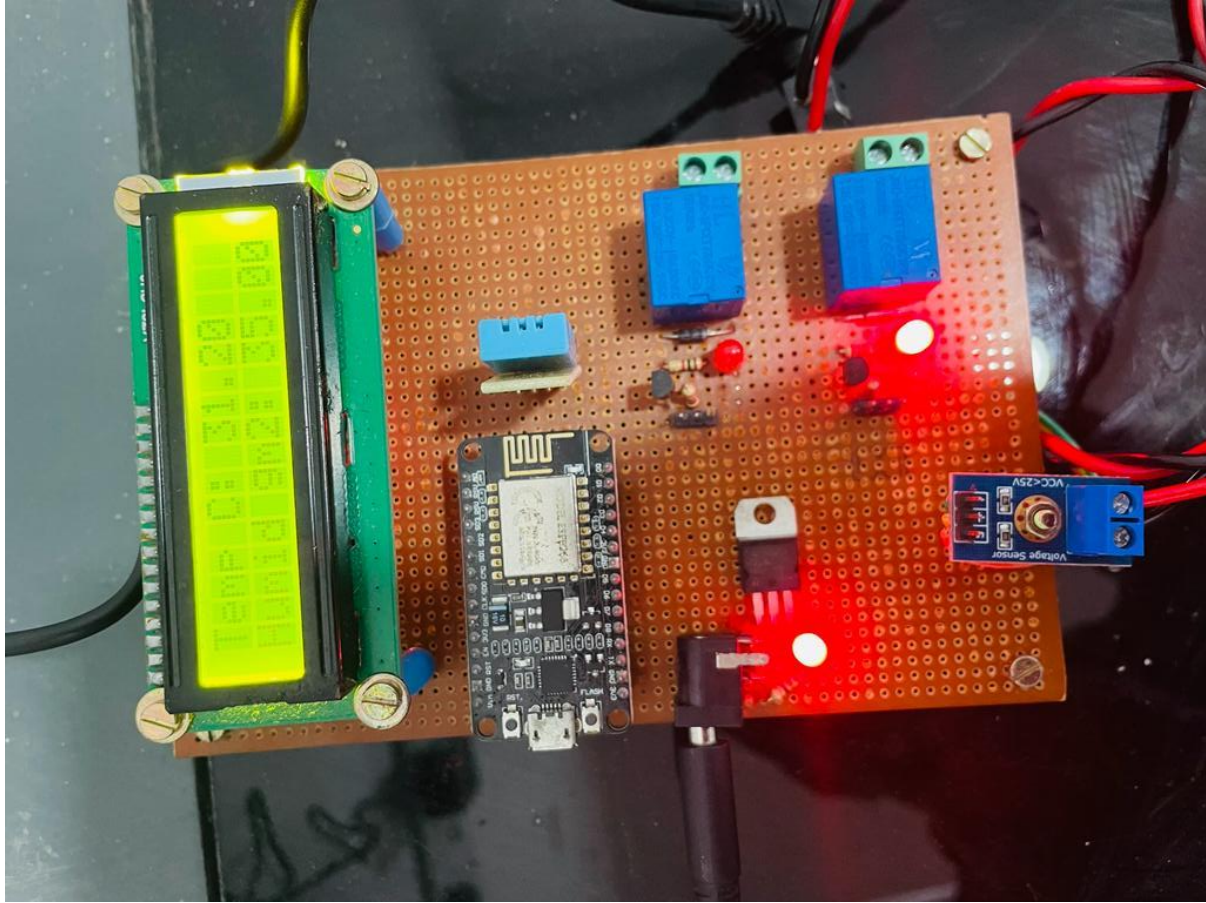
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APPENDIX

A. Working Snapshots of Project





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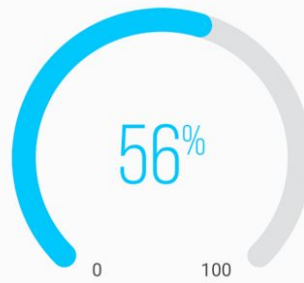
Temperature and H...



Temperature



Humidity



Power

1